INDEX TO VOLUME XXI.*

A

Absorption of dark heat rays, 236.
spectra of colorless liquids, 500.
Academy, National, list of papers, 84, 509.
Natural Sciences Philadelphia, Proceedings of, 81.
Acid, carbonic, of atmosphere, 401.
chlor-hyponitric, 234.
nitric, ignition by, 398.
saccharinic, 139.
sulphuric, manufacture of, 75, 144.
tropic, synthesis of, 139, 400.
Actinic balance, *Langley*, 187.
Agassiz, A., Chun's Ctenophoræ, 81.
Report on dredging by Steamer Blake, 328.
Air, results of analyses of, 83.
Alaska, notes on, *Dall*, 104.
Alkali lands, reclamation of, 407.
Alkaloids, natural mydriatic, 400.
Aluminum, atomic weight of, 321.
Ammonia, direct synthesis of, 498.
Arabinose, identical with lactose, 236.
Ashburner, C. A., Pennsylvania geology, 241.
Astronomical Bibliography, 415.
Society, Memoirs of, 335.
Atropine, 400.

B

Baird, S. F., Report of Fish Commission, 85.
Bailey, L. W., Geology of Southern New Brunswick, 506.
Barker, G. F., chemical abstracts, 66, 136, 232, 321, 396, 498.
Barometric pressure, *Hazen*, 361, 453.
Barrois, C., Hall's Devonian fossils of New York, 44.
Bauermann, H., Systematic Mineralogy, 506.
Becker, G. F., Constants of Nature, 510.
Becquerel, H., magnetic rotatory polarization of gases, 139.
Bell, A. G., production of sound by radiant energy, 463.
Bentham, G., notes on Cyperaceæ, 412.
notes on Orchideæ, 412.
Behring Strait, notes on, *Dall*, 104.
Berthelot, mercuric fulminate, 235.
chlorhydrates of metallic chlorides, 396.
pernitric oxide, 398.
Birds, toothed, 255.
Blake, W. P., realgar and orpiment in Utah, 219.
Blood-crystals and their coloring matter, 499.
Bolton, H. C., organic acids in examination of minerals, 80.
Bornet, E., Notes Algologiques, 508.
Bosnia, Herzegovina, geology of, 409.
BOTANY—
Cedar apples, 332.
Eucalyptographia, 249.
Gymnosporangia, *Farlow*, 332.
Movements of plants, 245.
Starch grains, origin of, 330.
Welwitchia, seedling of, 412.
Woods, strength of, 251.
See further under GEOLOGY.
Brackebusch, D. L., Minerals of Buenos Aires, 161.
Brackett, C. F., galvanometer for powerful currents, 395.
Braithwaite, R., British Moss-Flora, 329.
Bricks, mineral from, 157.
Bromoform, direct production of, 236.
Bruhl, J. W., relations between molecular structure and refractive power, 70.
Brush, G. J., American sulpho-selenides of mercury, 312.
Buffalo Society of Natural History, 338.
Building stones, durability of, 410.

C

Camphor, compound of with alcohol, 400.
Carnelley, T., ice at high temperatures, 385.
Carter, H. J., Carboniferous sponge-spicules, 158.
Chance, H. M., the millstone grit, 134.

* The Index contains the general heads BOTANY, GEOLOGY, MINERALOGY, ZOOLOGY, and under each the titles of Articles referring thereto are mentioned.

Chlorhydrates of metallic chlorides, 396.
Chloride of silver, solubility of in water, *Cooke*, 220.
Chloroform, direct production of, 236.
Chun, C., Ctenophoræ, 81.
Cincinnati Society of Natural History, Journal of, 409.
Clarke, A. R., Geodesy, 337.
Climate, changes of, 149, 150.
Clouds, dust, fogs and, 237.
Coal, Arctic, 157.
Coan, T., eruptions of Mauna Loa, 79.
Coast Survey Report, 77, 240, 416.
Cold, effect of on magnetism, *Trowbridge*, 316.
Collier, P., remarkable nugget of platinum, 123.
urano-thorite, 161.
Comet, (*a*) 1881, Swift, elements of, 509.
Comstock, W. J., analyses of onofrite, 312.
Cooke, J. P., physical notices, 70.
J. Thomsen's thermochemical investigations of structure of hydrocarbons, 87.
solubility of chloride of silver in water, 220.
William Hallowes Miller, 379.
Cope, E. D., Permian vertebrates of Texas, 407.
Corthell, E. L., Jetties at the Mouth of the Mississippi, 165.
Coues, E., American Ornithological Bibliography, 83.
Cutting, H. A., durability of building stones, 410.

D

Dall, W. H., notes on Alaska, 104.
Dana, E. S., Elementary Mechanics, 254.
Dana, J. D., geological terms, 326.
limestone of Westchester Co., N. Y., and New York Island, 425.
Darwin, C., Power of movement in Plants, 245.
Darwin, G. H., tidal friction, 402.
Dawson, G. M., Geological Map of British Columbia, 80.
geology of Peace River region, 391.
Delesse, Révue de Géologie, 244.
Descartes on Cosmology, 80.
Diffraction grating, coefficient of expansion of, *Mendenhall*, 230.
Domeyko, I., Mineralojia, 161.
Douglas, J. Jr., Lunge's Manufacture of Sulphuric Acid, 75.
Dowell, B. F., water-level in lakes of Oregon, 415.
Draper, J. W., phosphorograph of a solar spectrum, 171.
Dust, fogs and clouds, 237.
Dwight, W. B., fossils in Wappinger Valley limestone, 78.

E

Earthquake, Phillipine Islands, 52.
Earthquakes, recent American, 198.
Eaton, D. C., botanical notice, 330.
Eclipse of July 29th, 1878, 334.
Engineers, Report of Chief of, 84.
Electrical shadows, *Fine* and *Magie*, 394.
Electricity, International Exposition of, 164.
Electrodes, metallic in hydrogen, 323.
Elevations, supposed of New England Coast, 77.
Ellis, W., magnetic declination and sun spots, 238.
Ethers, indices of refraction, *Long*, 279.

F

Farlow, W. G., Gymnosporangia of the United States, 332.
botanical notices, 507.
Fine, H. B., shadows obtained during the glow discharge, 394.
Fogs, clouds, dust and, 237.
Forbes, S. A., Food of Fishes, 338.
Ford, S. W., the genus Obolella, 131.
Fossils, see GEOLOGY and ZOOLOGY.

G

Galvanic elements, chemical energy and electromotive force of different, 74.
Galvanometer for powerful currents, *Brackett*, 395.
Gases, absorption of dark heat rays by, 236.
action of radiant heat on, 323, 324.
magnetic rotatory polarization of, 139.
influence of on reflecting surfaces, 140.
in smoky quartz, 203, 209.
under electrical discharges, 75.
Geikie, A., lava-fields of Europe, 145.
Geissler thermometers, 449, 451.
Geographical Congress, International, 337.
Geological Congress at Bologna, 325.
map of United States, 505.
map of Southern Columbia, 80.
map of Florida, 305.
colors, and terms, 326.

GEOLOGICAL REPORTS AND SURVEYS—
Canada, 243, 410, 506.
Colorado, 408.
Indiana, 166, 410.
National, 416.
New Brunswick, 506.
New Jersey, 409.
North Carolina, 410.
Pennsylvania, 153, 241, 329, 409.
Queensland, 159.
Territories, 83, 244, 328.
GEOLOGY—
Alaska, notes on, *Dall*, 104.
Albany granite, *Hawes*, 21.
Allodon, *Marsh*, 511.
Alps, fossils of the Apuan, 328.
Jurassic, of St. Gothard Tunnel, 405.
the great fault in, 406.
Amyzon shales, *Cope*, 328.
Annelid jaws from the Wenlock and Ludlow of England, 244.
Anthracopupa, *Whitfield*, 126.
Bird, Jurassic, *Marsh*, 341.
Birds, toothed, 255.
Chalk, sponge-spicules from, 407.
Channel-fillings, Devonian, *Williams*, 318.
Climate of geological time, 149, 150.
of Siberia in era of Mammoth, 148.
Coal, Arctic, 157.
Cœluria, *Marsh*, 339.
Cretaceous of Queen Charlotte Is., 243.
Dawsonella, *Whitfield*, 125.
Devonian fossils of New York, 44.
Diluvium, red, of Europe, 155.
Dinosaurs, American Jurassic, 167, 417.
Docodon, *Marsh*, 512.
Elevations, supposed, on the New England Coast, 77.
Euphoberia, *Scudder*, 182.
Fishes, Devonian, *Whiteaves*, 494.
Florida, geology of, *Smith*, 292.
Fossils in metamorphic rocks in U. States, 78; Italy, 327; Alps, 405.
Frost, action of in arrangement of earthy material, 345.
Glacial era, date of, *Wright*, 120.
phenomena in Minnesota, *Winchell*, 358.
of the Sierra Nevada, 149.
Gulf of Mexico, *Hilgard*, 288.
Insects, Devonian, *Scudder*, 111.
Jasper beds of Tuscany, 407.
Lakes, changes of level in, 415.
Laopteryx, *Marsh*, 341.
Lava-fields of Northwestern Europe, 145.
Limestone of Westchester County and New York Island, *Dana*, 425.
GEOLOGY—
McKean Co., Penn., *Ashburner*, 241.
Mammals, Jurassic, *Marsh*, 511.
Metamorphic rocks, fossils in, 78, 327, 405.
Millstone grit, *Chance*, 134.
Mollusks, Carboniferous, *Whitfield*, 125.
Mountain making, *McGee*, 276.
Myriapods, Carboniferous, *Scudder*, 182.
New York Island, *Dana*, 425.
Obolella, *Ford*, 131.
Paleozoic, thickness of in Penn., 242.
Peace River region, *Dawson*, 391.
Permian vertebrates of Texas, 407.
Proëtus longicaudus, *Williams*, 156.
Pterodactyls, American, *Marsh*, 342.
Quaternary in Europe. 155.
River channels, re-eroded, 155.
Sahara, the northern, 157.
St. Gothard tunnel, 405.
Sandstone, structure of, 152.
Shetland Is., glaciation of, 158.
Slates, structure of, *Sorby*, 153.
Sponge-spicules, Carboniferous, 158.
from the chalk, 407.
Terminology, 326.
Wappinger Valley fossils, 78.
Westchester Co., limestone, *Dana*, 425.
Goodale, G. L., origin of starch grains, 330.
botanical notices. 249.
Gordon, E. H., Electricity and Magnetism, 86, 140.
Gravity at the summit of Fujiyama, *Mendenhall*, 99.
Gray, A., Darwin's Power of Movement in plants, 245.
Grinnell, G. B., notice of Odontornithes, 255.
Gulf of Mexico, *Hilgard*, 288.

H

Hall, J., Devonian fossils of N. York, 44.
Hannay, J. B., volcanic action, 147.
Harrison, B. F., rain-fall in Wallingford, Conn., 496.
Hastings, C. S., constitution of the sun, 33.
Haughton, S., Lectures on Physical Geography, 150.
Hawes, G. W., Albany granite, New Hampshire, 21.
liquid carbon dioxide in smoky quartz, 203.
Hazen, H. A., projection of lines of equal pressure, 361.
reduction of air pressure to sea-level, 453.

Heat, measurement of, 187.
sound from intermittent beam of, 323, 324, 463.
Heat-rays, absorption of by gases and vapors, 236.
Helmholtz, H., Popular Scientific Lectures, 510.
Hennessy, figure of Mars, 162.
Henry, Joseph, memorial of, 416.
Hidden, W. E., minerals of Alexander Co., North Carolina, 159.
octahedrite, Burke Co., N. C., 160.
xenotime, Burke Co., N. C., 244.
Whitfield Co. meteoric iron, 286.
geniculated zircons, 507.
Hilgard, E. W., Agricultural Report, 407.
Hilgard, J. E., Gulf of Mexico, 288.
Clarke's Geodesy, 337.
Hitchcock, C. H., Geological map of United States, 505.
Houzeau, J. C., Bibliography of Astronomy, 253.
Hydrocarbons, structure of, 87.
of American petroleum, 137.
Hyoscin, 400.
Hyoscyamine, 400.

I

Ice at high temperatures, *Carnelly*, 385.
of buried glacier in Alaska, 107.
Indigotin, Bäyer's synthesis of, 69.
Inulin, 138.
Iodine vapor, density of, 232.
Iron, volumes of solid and liquid, 147.
Iron-ores, genesis of, 80.
Isopropylene-neurine, 70.

K

Kansas City Review of Science and Industry, 86.
Kerr, W. C., topography of North Carolina, 216.
action of frost in arrangement of earthy material, 345.
König, G. A., jarosite, 160.

L

Lakes of Oregon, changes of water-level in, 415.
Lancaster, A., Bibliography of Astronomy, 253.
Langley, S. P., the actinic balance, 187.
LeConte, J., Sight, noticed, 405.
Lesquereux, L., Coal Flora, 329.
Light, indices of refraction of compound ethers, *Long*, 279.
Lightning conductor, space protected by, 141.
Loomis, E., contributions to meteorology, 1.
Long, J. H., indices of refraction of compound ethers, 279.
Lunge, G., Manufacture of Sulphuric Acid, 75, 144.

M

Magie, W. F., shadows obtained during the glow discharge, 394.
Magnetic declination, and sun-spots, 238.
in Missouri, 241.
survey of Missouri, *Nipher*, 310.
Magnetism, effect of cold on, *Trowbridge*, 316.
Mallet, J. W., atomic weight of aluminum, 321.
Mars, figure of, 162.
Marsh, O. C., American Jurassic Dinosaurs, 167, 417.
Cœluria, 339.
Laopteryx, 341.
American Pterodactyls, 342.
Jurassic mammals, 511.
Odontornithes of, noticed, 255.
Mauna Loa, eruptions of, 79.
McGee, W. G., orographic displacement, 276.
Mell, P. H., the Claiborne group, 157.
Mendenhall, T. C., gravity at the summit of Fujiyama, 99.
coëfficient of expansion of a diffraction grating, 230.
Meteorology of Tokio, 85.
Mercuric fulminate, 235.
Mercury-pump, new form of, 401.
Meteoric iron, chromite in, *Smith*, 461.
Lexington Co., S. C., 117.
Whitfield Co., Ga., *Hidden*, 286.
Meteorology, contributions to, *Loomis*, 1.
MINERALS—
Begeerite, 411.
Beryl, 159.
Chromite in meteoric iron, 461.
Columbite, analysis of, 412.
Culebrite, 315.
Cyanite of New York Island, 428.
Dolomite of N. York Island, analysis of, 435.
Eleonorite, 411.
Guadalcazarite, 315.
Hiddenite, *Smith*, 128.
Jarosite, 160.
Lazulite, from Canada, 410.
Metacinnabarite, 316.
Monazite, 159.
Neocyanite, 412.
Octahedrite, 160.
Onofrite, 312, 315.

MINERALS—
Orpiment, 219.
Orthoclase, 160.
Picite, 411.
Pyroxene of New York Island, 430.
Quartz, 159.
gases in smoky, 203, 209.
Realgar, 219.
Riolite, 315.
Rutile, 159.
Spodumene, 128, 159.
Tourmaline, 160.
Urano-thorite, 161.
Xenotime, 244.
Zinc-ore, 502.
Zircons, geniculated, 507.
Missouri, magnetic survey of, *Nipher*, 310.
Mitchell, H., on changes of level on New England coast, 77.
Morley, E. W., analyses of air, 83.
Mountain-making, *McGee*, 276.
Müller, F. v., Eucalyptographia, 249.

N

Nebulæ, photographs of, 401.
Neurine, containing oxyisopropyl, 70.
Newberry, J. S., genesis of ores of iron, 80.
Newton, H. A., obituary of M. Chasles, 165.
Nicholson, H. A., Silurian Fossils of the Girvan District, 243.
Nipher, F. E., magnetic survey of Missouri, 310.
North Carolina, minerals of, 410.
topography of, 217.

O

OBITUARIES—
Almeida, J. C., 86.
Bigsby, J. J., 338.
Boricky, E., 338.
Brodie, Benjamin C., 86.
Chasles, Michel, 86, 165.
Clay, J. A., 338.
Delesse, A., 416.
Miller, W. H., 379.
Peirce, B., 337.
Tennant, J., 338.
Watson, J. C., 62.
Ocean temperatures, arctic, 163.
Odontornithes, noticed, 255.
Oxide, pernitric, 398.
Ozone, presence of in the atmosphere, 66.
researches on, 233.

P

Packard, A. S., Zoology, not., 162.
Pagosa Springs, water of, 84.
Paleontology of Austria-Hungary, 157.
Peirce, B., memorial volume, 337.
Penfield, S. F., analysis of jarosite, 160.
Petroleum from the Caucasus, 67.
Phosphorograph of a solar spectrum, *Draper*, 171.
Photographs of nebulæ, 401.
Photophone, *Bell*, 463.
Platinum, atomic weight of, 398.
nugget of, *Collier*, 123.
Polarization of the corona, *Wright*, 334.
magnetic rotatory of gases, 139.
Potassium iodide from seaweed, 136.
Powell, J. W., appointed Director of Survey of National Domain, 416.
Introduction to Indian languages, 166.
Preece, W. H., space protected by lightning conductor, 141.
Pressure, soldering by, 336.

R

Rabenhorst's Kryptogamen-Flora, 507.
Rain-fall in Wallingford, Conn., *Harrison*, 496.
Refractive power and molecular structure of organic compounds, 70.
Révue de Géologie, 244.
Reynolds, J. E., mineral from bricks, 157.
River-channels re-eroded, 155.
Robinson, J., Flora of Essex Co., 251.
Rockwood, C. G., meteorological notice, 85.
recent American earthquakes, 198.
Rolland, S., the northern Sahara, 157.
Röntgen's Thermodynamics, 86.
Rowland, H. A., Geissler thermometers, 451.
Royal Society, medals of, 86.
Russell, T., calibration of thermometers, 373.

S

Saccharin, 139.
Sahara, the northern, 157.
Schmidt, A., zinc-ore of Wiesloch, 502.
Scudder, S. H., Devonian insects, 111.
Carboniferous myriapods, 182.
Sea, see *Ocean*.
Sequoiene, 68.
Shepard, C. U., meteoric iron, Lexington Co., S. C., 117.
Sherman, O. T., arctic ocean temperatures, 163.
Siberia, climate of in era of Mammoth, 148.
Smith, E. A., geology of Florida, 292.
Smith, J. L., hiddenite, 128.
chromite in meteoric iron, 461.
Smithson, J., Life of, 166.

Sodium hyposulphite, composition of, 397.
Solar system, evolution of. 402.
see also *Sun* and *Spectrum*.
Soldering by compression, 336.
Sorby, H. C., presidential address, 152.
Sound from intermittent radiant heat, 323, 324, 402, 463.
supposed polarization of, 501.
Spectrum of compound of carbon with hydrogen and nitrogen, 74.
absorption, of colorless liquids, 500.
solar, *b* line in, 323.
phosphorograph of, *Draper*, 171.
Standards of length, American, 240.
Stevenson, J. J., river-channels filled and re-eroded, 155.
Sulph-hydrates, color reactions of, 397.
Sun, constitution of, *Hastings*, 33.
parallax of, *Todd*, 491.
Sun spots and magnetic declination, 238.
Swift's comet (*a*) 1881, 509.

T

Tardy, red diluvium of Europe, 155.
Terminology in geology, 326.
Thallium-papers, meteorological use of, 66.
Thermometers, calibration of. *Russell*, 373.
Geissler, 449, 451.
Thermometry, *Waldo*, 57, 226, 443.
Thiesen, Geissler thermometers, 449.
Thomsen's thermochemical investigations, 87.
Tidal friction, *G. H. Darwin*, 402.
Time Signals, distribution of, 414.
Todd, D. P., solar parallax, 491.
Trowbridge, J., physical notices, 74, 139, 236, 323, 401.
effect of cold on magnetism, 316.

U

Utah, iron ores of Southern, 80.

V

Vanadium sulphides, 137.
Verrill, A. E., zoological notices, 162.
giant squid at Grand Banks in 1875, 251.
Verrill, A. E., regeneration of lost parts in the squid, 333.
affinities of Halysites, 508.
Volcanic action, volumes of solid and liquid cast-iron with reference to, *Hannay*, 147.
Volcanoes, eruptions of Mauna Loa, 79.
Volumes at the boiling point, 136.

W

Waldo, L., thermometry, 57, 226, 443.
Wappinger Valley limestone fossils, 78.
Watson, S., Botany of California, 251, 330.
Wetherby, A. G., Freshwater Mollusks of North America, 414.
Whiteaves, J. F., fossil fishes from Devonian of Scaumenac Bay, 494.
Whitfield, R. P., Carboniferous air-breathing mollusks, 125.
Whitney, J. D., climatic changes of later geological times, 149.
Williams, H. S., Proëtus longicaudus, 156.
channel-fillings in Devonian shales, 318.
Winchell, A., James Craig Watson, 62.
Winchell, N. H., Dall's observations on arctic ice, 358.
Winter, G., Rabenhorst's Kryptogamen-Flora, 507.
Woods, strength of, 251.
Wright, A. W., gases in smoky quartz, 209.
polarization of the corona, 334.
Wright, G. F., date of Glacial era, 120.
Wurtz, A. D., Atomic Theory, 337.

Y

Yellowstone Park, geol. charts of, 244.
Young, C. A., *b*-line in solar spectrum, 323.

Z

Zeitschrift für Instrumentenkunde, 253.
Zinc-ore deposits of Wieslock, 502.
Zoology—
Cœlenterates, development of, 83.
Halysites, affinities of, 508.
Squid, giant at Grand Banks, 251.
regeneration of lost parts in, 333.
See further under Geology.